FUNGICIDAL CONTROL OF POPLAR LEAF SPOTS

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Abstract

Four fungicides were tested for control of poplar leaf spots caused by species of Septoria and Marssonina at the Alberta horticultural Research Center, Brooks, and at the PFRA Tree Nursery, Indian Head, Saskatchewan. Effective control was obtained with six applications of either benomyl, thiophanate-methyl, maneb, or fixed copper. Studies on the timing of applications, using benomyl, demonstrated that effective leaf spot control can be obtained with three fungicide applications, beginning mid- to late June and continuing at 10-day intervals until early to mid-June.

Resume

L'auteur Bprouva quatre fongicides afin de réprimer les taches des feuilles de Peuplier causdes par certaines espèces de septoria et de Marssonina à l'Alberta Horticultural Research Center, à Brooks, et au PFRA Tree Nursery, à Indian Head, Saskatchewan. La répression s'avéra effective avec 6 applications de soit du bdnomyl, du thiophanate méthylique, du maneb ou du cuivre "fixé" (chlorures basiques de cuivre). Avec le bénomyl, la répression efficace s'opère dans le temps suivant: 3 applications, la première commençant vers le milieu ou la fin de juin et les autres se poursuivant à intervales de 10 jours jusqu'au début ou au milieu de juillet.

Fungicidal control has been indicated for septoria and Marssonina leaf spots in the Canadian Prairies (1) and in Europe (2, 3, 4, 5). The diseases, their control, and their impact in Alberta and Saskatchewan nurseries have been previously reviewed (1).

In previous data (1) there was an indication that the first application of fungicides (benomyl and thiophanate-methyl) effectively curtailed the development of poplar leaf spots. This implies that proper timing of fungicide applications could produce satisfactory control of the disease with fewer applications of fungicide, thus eliminating the need for extensive spraying for leaf spot control, which can be quite expensive.

Field tests of four fungicides for control Of poplar leaf spots were made in 1972, and timing of applications was evaluated in 1972 end 1973. The results of these tests are reported here.

Fungicide Evaluation Experiments

Materials and methods

Experimental plots of 'Northwest' poplar (Populus 'Northwest') and 'Brooks No. 6' (P. 'Brooks No. 6') were located at the PFRA Tree Nursery, Indian Bead, Saskatchewan and the Alberta Horticultural Centre, Brooks, respectively in 1972. Plots of 5-6 stools each were arranged in a completely randomized block design and were replicated 6 times at Indian Head and 4 times at Brooks.

The following fungicides were used in the experiment: Benlate 50% W.P., 50% benomyl; C-O-C-S, W.P., 50% fixed copper (basic copper chlorides); Manzate-D, W.P. 80% maneb; NF-44 (Topsin), W.P., 70% thiophanate-methyl.

six applications of fungicides were applied at 10-day intervals, starting in mid-June. They were applied at 150 psi from a high-pressure sprayer at the rate of 100 gallons per acre. Triton 1956-B spreader-sticker was used in the experiments.

Leaf spot severities corresponding to the percentaqe of leaf area spotted were rated on a scale of 1 to 11, with 1 = no disease and 11 = all leaves dead, e.q. visual ratings of 2 and 10 indicate ranges of disease of 0-3% and 94-97% respectively, while a rating of 6 has range of 25-50%. As in previous experiments (1) no distinction was made between leaf spots caused by Septoria spp. or Marssonina sp. During the growing season at Brooks, ratings were made on five whips from each check plot. Final ratings were made from five whips of each replicate. All data are given as means of six and four replicates (Indian Head and Brooks, respectively) with Duncan's multiple range test used for mean comparisons.

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Table 1. Leaf spot development on the nonsprayed poplar hybrid Brooks #6, 1972

Date	No. leaves per whip*	Leaves with spots*		Dead leaves*		Disease %
		NO.	%	NO.	%	
June 15	14.5	0.6	4.4	0.2	1.5	1.6
June 27	18.8	5.6	29.5	0.2	1.1	2.3
July 6	20.8	11.6	55.7	0.6	2.6	7.0
July 17	24.3	17.5	71.8	1.7	6.8	12.2
July 27	28.5	18.9	66.1	3.4	11.9	18.9
August 8	29.2	24.5	83.7	7.3	25.0	41.5
August 28	35.3	29.5	83.4	12.4	35.1	43.2

* Average of 5 whips × 4 replicates.

Results

The incidence of disease at Brooks at the beginninq of the growing season was considerably lower in **1972** than in **1971.** On July **7. 1971,** the leaf spot severity was **27.1%** at Brooks **(1)** whereas on July **6. 1972, it** was only **7.0%** (Table **1).** However, leaf spot severity increased gradually throughout the growing season to **43.2%** at Brooks **(37.3%** in **1971)** and **50.9%** (Table **2)** at Indian Head (50.5% in **1971).** In **1972,** the percentage and number of dead leaves increased steadily from **1.5%** to **35.1%** and from **0.2** to **12.4** leaves per whip.

In both tests at Brooks and Indian Head all chemicals significantly reduced leaf spot severity, percentage of leaves infected, and percentage of dead leaves (Tables **2 & 3).** With the exception of ***C-0-C-S*** at Brooks there were no differences in effectiveness between the chemicals with regard to control of leaf spot severity and reduction of percent dead leaves. Benomyl was significantly more effective than the other chemicals in reduction of leaves infected at Indian Head: however, at Brooks, thiophanate-methyl compared favorably with benomyl.

Data in Tables **2** and **3** show that six applications of the chemicals had no effect on leaf production. Again, as in **1971.** more leaves per whip were produced at the Brooks station than at Indian Head.

Data presented here and elsewhere **(1)** confirm that poplar leaf spot incidence can be reduced by fungicides. Leaf **spot** development was completely inhibited after the first application of benomyl or thiophanate-methyl as shown in the data from Brooks (Tables **1** and **3).** The final percent disease €or the two chemicals was **1.1** and 0.6 respectively, where the initial disease percentage on June **15, 1972, in** the check plots was **1.6.** Similar data are shown for the percentage of dead leaves. **1.5** on June **15, 1972,** and **0.7** and **0.3,** respectively, for benomyl and thiophanate-methyl on August **28, 1972.**

Table 2. Effect of fungicides on poplar leaf spots, Indian Head, Saskatchewan, 1972

Fungicide and rate per 100 gallons	Leaves per whip	Disease %	Leaves with spots %	Dead leaves %
Benlate, 1 lb	32.2 a*	15.5 a	23.6 a	15.2 a
NF-44, 0.75 lb	32.8 a	16.2 a	48.9 c	15.0 a
C-0-C-S, 4 lb	32.5 a	20.4 a	36.3 b	18.9 a
Manzate D, 2 lb	30.7 a	16.7 a	66.6 d	14.9 a
Check	33.2 a	50.9 b	93.0 e	43.6 b

* The small letters indicate Duncan's multiple range groupings of treatments which do not differ significantly at the 5% level.

Table 3. Effect of fungicides on poplar leaf spots, Brooks, Alberta, 1972

Fungicide and rate per 100 gallons	Leaves per whip	Disease %	Leaves with spots %	Dead leaves %
Benlate, 1 lb	35.8 a	1.1 a	9.9 a	0.7 a
NF-44, 0.75 lb	34.2 a	0.6 a	9.2 a	0.3 a
C-0-C-S, 4 lb	35.9 a	10.4 b	33.8 b	8.9 b
Manzate D, 2 lb	33.5 a	4.3 a	36.1 b	3.1 a
check	35.3 a	43.2 c	83.4 c	35.1 c

* The small letters indicate Duncan's multiple range groupings of treatments which do not differ significantly at the 5% level.

Table 4. Leaf spot development on the nonsprayed poplar hybrid Brooks #6, 1973

Date	No. leaves per whip*	Leaves with spots*		Dead leaves*		Disease %
		NO.	%	NO.	%	
June 14	11.8	0.0	0.0	0.0	0.0	0.0
June 25	16.24	0.0	0.0	0.0	0.0	0.0
July 5	20.0	12.1	60.3	0.0	0.0	2.0
July 16	25.8	14.0	54.3	0.5	1.9	5.8
July 26	30.2	15.2	50.4	2.4	7.8	13.9
August 9**	34.9	17.9	51.1	5.9	16.7	20.60
August 27**	35.8	32.3	90.1	8.9	24.80	29.5

* Average of 5 whips x 5 replicates.

** Average of 5 whips × 4 replicates.

Table 5. Time of benomyl application vs. poplar leaf spots, Indian Head, 1972

Date† of application	Leaves per whip*	Disease %	Leaves with spots %	Dead leaves %
1, 2, 3, 4, 5, 6	32.2 a	15.5 a	23.6 a	15.2 a
1, 2, 3	32.1 a	18.0 a	46.5 b	16.9 a
2, 3, 4	31.5 a	19.4 a	42.0 b	18.6 a
3, 4, 5	30.7 a	22.6 a	58.2 c	20.7 a
4, 5, 6	32.5 a	23.9 a	65.9 c	20.4 a
Check	33.2 a	50.9 b	93.0 d	43.6 b

† 1 - June 15; 2 - June 27; 3 - July 6; 4 - July 17; 5 - July 27; 6 - August 8.

* The small letters indicate Duncan's multiple range groupings of treatments which do not differ significantly at the 5% level.

Fungicidal Spray Timing Experiments

Materials and methods

It is not economically feasible to spray over the entire growing season, as this would require 6 to 9 fungicide applications. To determine the optimum timing of fungicide applications, several overlapping spray series of three applications each were evaluated, with each series started at different times. For convenience of tracking, each spray application was given a number 1 through 6 to correspond to the date when applied. The first series of sprays started on June 15 in 1972, and on June 14 in 1973. Once started, spray applications within a series were continued at 10-day intervals. The latest application in a series was on August 7 in both years. Benomyl (Benlate) was used at 1 lb per 100 gal in both 1972 and 1973.

The plot size, the method of fungicide application, and final evaluation of the data were as described in the previous section on fungicide evaluation. The timing experiments were carried out at Brooks and Indian Head in 1972 and at Brooks in 1973. Plots were replicated 5 times at Brooks in 1973; however, between July 26 and August 9, the first replicate was destroyed.

Table 6. Time of benomyl application vs. poplar leaf spots, Brooks, 1972

Date† of application	Leaves per whip*	Disease %	Leaves with spots %	Dead leaves %
1, 2, 3, 4, 5, 6	35.8 a	1.1 a	9.9 a	0.7 a
1, 2, 3	36.9 a	4.1 a	30.9 b	3.2 ab
2, 3, 4	35.1 a	4.2 a	18.1 a	3.5 ab
3, 4, 5	32.1 a	11.4 b	44.7 bc	9.2 bc
4, 5, 6	34.1 a	15.3 b	53.4 c	13.0 c
Check	35.3 a	43.2 c	83.4 d	35.1 d

† 1 - June 15; 2 - June 27; 3 - July 6; 4 - July 17; 5 - July 27; 6 - August 8.

* The small letters indicate Duncan's multiple range groupings of treatments which do not differ significantly at the 5% level.

Table 7. Time of benomyl application vs. poplar leaf spots, Brook!;, 1973

Date† of application	Leaves per whip*	Disease %	Leaves with spots %	Dead leaves %
1, 2, 3, 4, 5, 6	34.5 a	2.0 a	4.6 a	2.0 a
1, 2, 3	34.5 a	3.7 a	33.6 cd	2.9 a
2, 3, 4	40.0 ab	5.8 ab	28.6 cd	4.7 ab
3, 4, 5	42.3 c	10.7 c	30.2 cd	9.4 c
4, 5, 6	40.6 bc	17.3 d	39.8 d	15.2 d
1, 3, 5	39.3 abc	5.1 ab	15.4 ab	4.5 ab
2, 4, 6	38.4 abc	8.7 bc	25.9 bc	8.1 bc
Check	35.8 ab	29.5 e	90.1 e	24.8 e

† 1 - June 14; 2 - June 25; 3 - July 5; 4 - July 16; 5 - July 26; 6 - August 6.

* The small letters indicate Duncan's multiple range groupings of treatments which do not differ significantly at the 5% level.

Results

Leaf spot development in the non-sprayed plots at Brooks in 1972 and 1973 are shown in Tables 1 and 4 respectively. The onset of the disease was considerably later in 1973 than in previous years; however, the pattern of development throughout the growing season was similar. Leaf spot severity increased from 0% on June 14 to 29.5% on August 27. Similar increases in numbers of leaves spotted and numbers of dead leaves were observed, 0 to 32.3 and 0 to 0.9, respectively.

The results of the spray timing experiments, shown in Tables 5, 6, and 7, demonstrate the importance of fungicidal coverage during late June to mid-July. The best series of three sprays (1, 2, 3) reduced leaf spot severity by 65% at Indian Head in 1972, by 91% at Brooks in 1972, and by 88% at Brooks in 1973. As expected, six sprays, covering mid-June to early August resulted in better control than three sprays, reducing leaf spot severity by 70%, 98%, and 94% respectively. Similar data are shown for percent dead leaves.

In all tests the percentages of spotted leaves in the 2, 3, 4 series were lower than in any other series of three successive sprays, but these differences were significant only at Brooks in 1972.

The data presented in Table 7 show that three sprays 20 days apart (series 1, 3, 5) gave as good control as series 1, 2, 3, 4, 5, 6; series 1, 2, 3; and series 2, 3, 4. The alternate series (2, 4, 6) gave significant control of leaf spots but was not as good as the above mentioned series. It must also be noted that all series of three sprays in all three tests gave singificant control of poplar leaf spots.

Poplar leaf spots can be effectively controlled with three applications of benomyl beginning mid- to late June and at 10-day intervals until early to mid-July. Equally effective is a series of three applications of fungicide at 20-day intervals starting in mid-June. However, a recommendation for the use of benomyl cannot be made until the chemical is properly registered for use on poplars.

Literature cited

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